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ComputerNews

Speaking of Laser Printers

See Page 1

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The Editor
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Canada M5S 1A1

Network address:
PARROTT at UTORONTO
(NetNorth/BITNET/EARN)

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Something Different

Martha Parrott
PARROTT at UTORONTO

This issue of *ComputerNews* is unusual, though not unique, in having a special section: on laser printers. Not the large laser printers that must attach themselves to mainframe computers, but the small table-top printers associated primarily with microcomputers. A glance at past issues reveals that printing has been a frequent topic here, but always in the context of a particular problem or application. The need for some concentrated, basic information on these devices has become increasingly apparent as users, and many UTCS staff as well, struggle along the road to "flexible, high-quality output."

It is impossible to detail everthing you might need to know about laser printers in anything short of a book. However, we do hope to enlighten you on the inner workings of a laser printer, and on the nature and importance of PostScript. The last article in the section discusses the new crop of Apple printers.

Laser Printers: How Do They Work?

Alex Nishri
nishri@gpu.utcs.toronto.edu
ALEX at UTORONTO

In the last few years, small laser printers have become an affordable alternative to impact printers for use with personal computers. They offer great flexibility in producing medium-resolution graphics and text, producing output from a variety of application packages. All of this is achieved through a combination of laser, xerographic, and electronics technology. How does it work?

At the heart of the laser printer is the print engine, sometimes called the *marking engine* (see the figure below). Inside the print engine is a photoconducting drum. As the drum rotates, it is given a negative static charge by a fine wire. Next, an inexpensive semiconductor laser paints on the drum an image of the required output. This is done by reflecting the beam with a rapidly rotating mirror. As the beam scans across the drum, the light is turned on and off as needed to *paint with light* the required image. The parts of the photoconductor drum struck by the light conduct electricity, and so those areas lose their negative charge.

Next, a toner is applied to the drum. The toner is made of meltable plastic resin and carbon black. The toner particles are intentionally rubbed against each other before being applied, and, just as you get a static charge when you rub your feet across a carpet, the particles acquire a negative charge. Since like charges repel, the toner does not stick to the negatively charged areas of the drum, but only to those that lost their negative charge when struck by the laser light.

Meanwhile, a sheet of paper is fed into the laser printer. On its way to the drum, it runs by another wire that gives it a positive static charge. Since opposite charges attract, the negatively charged toner (forming the desired image) sticks to the paper as it rolls against the drum. The paper continues on between two rollers heated to 200° Celsius, and the heat fuses the toner to the paper.

Finally, the drum goes by a cleaner blade, which removes any excess toner, and by a lamp, which drains off any excess negative charge. The process can now be repeated.

This is how print engines like the Canon LBP-CX and the newer Canon LBP-SX work. They are sometimes referred to as negative printers because the drum starts out white and the laser shines on the areas that will be black. Other print engines, such as the Xerox 1200 printing engine, are postive printers, that is, the drum is initially black and the light paints where the paper should be white. Consequently, negative

continued...

printers can print thinner lines, but some people feel that positive engines, like the Canon engine, produce nicer looking output.

For all their flexibility with graphics and typefaces, laser-printer engines do have drawbacks. Laser printers make originals that look like photocopies, hardly surprising since photocopiers use the same xerograhic technology as laser printers. Because the negatively charged toner particles repel each other, black areas may be uneven on some laser printers. Also, statically charged particles are unstable, so edges can be rough, and stray bits of black may occur with some print engines.

Another thing to remember is that laser printers are black-and-white output devices. Various shades of grey can be produced, but only by printing patterns of black and white dots. (Although colour laser printers exist, they are prohibitively expensive for most of us.)

The Canon engine, on which such popular printers as the Apple LaserWriter and the Hewlett-Packard LaserJet are built, has a print quality of 300 dots per inch (dpi). While this is a function of the dot size that the laser can write on the photoconductor drum (.1 mm), it is also affected by the fact that the paper quality and toner fusing distorts the dots into irregular shapes.

Besides a print engine, a laser printer needs some electronics to control the laser and to communicate with your computer. Because a page must be printed all at once, the control electronics must store up information on all the dots on the page before printing. Look at the Canon engine again. At 300 dpi there are about eight million dots on a page. The control electronics store each dot (black or white) as a bit (one or zero). Representing the whole page at 300 dpi therefore takes about one megabyte (MB) of memory (RAM)!

This brings us to one of the reasons that laser-printer prices vary, even for printers using the same print engine. Not all printers have enough RAM to store, and therefore print, an entire page at 300 dpi. More-

continued...

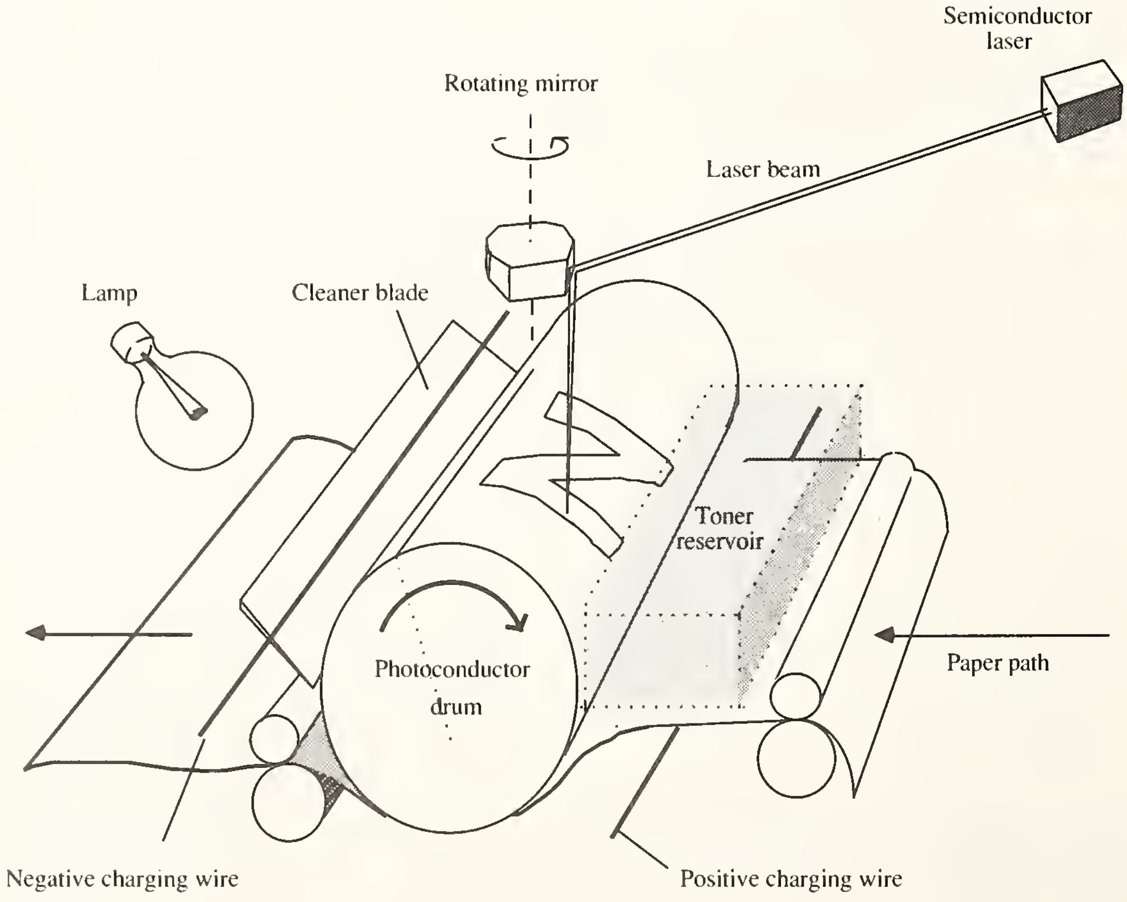

Illustration by Nikki Yokokura.

Figure: Print Engine of a LaserWriter

over, laser printers usually store some of their fonts in Read Only Memory (ROM); the more ROM, the more fonts are readily available. The graphics and text flexibility of laser printers is thus directly related to the amount of RAM and ROM available in the printer, and this contributes to the cost differences among laser printers.

In conclusion, the parts of a laser printer help determine the characteristics of the output. The print engine determines the quality of printing possible. The xerographic technology used in these engines allows flexibility in the type of graphics and text that can be printed, but it has some of the same drawbacks as photocopiers. The control electronics are essential for communication between the laser and the computer. The amount of RAM can determine how much of each page can be used at the print engine's full quality, and the overall control electronics determine the flexibility in outputting complex graphics and text.

Laser Printers: A Basic Choice

Terry Jones
TJ at UTORONTO

With ever improving quality output, greater speed, and more capability, laser printers are also growing in popularity as prices decrease. The expanding laser market makes it more difficult to select a printer for your needs. This article should shed some light on differences between various families of laser printers and on how these differences might affect your choice of printer.

Laser printers today do much more than simply print text. They can print in different type-styles or fonts and in various sizes of type; they can also do graphics. The difference between laser printers is gauged by how easily, how well, and how fully they do these various tasks.

To begin our study, let's consider a Hewlett-Packard (HP) LaserJet. (A newer model of the HP LaserJet is called the LaserJet Series II.) This printer, which is supported (or driven) by a wide range of software, was one of the first desktop laser printers. It produces very high quality output, though it has limited capabilities in some areas, such as desktop publishing. It is also relatively inexpensive. Its high quality output and its relatively low cost make the HP LaserJet printer the right choice for many office applications.

The LaserJet can print almost any type-size or style, but very few font choices are built in. It comes with two sizes of a typewriter-style font and can produce landscape (horizontal) and portrait (vertical) output. To expand its capabilities, you can purchase either plug-in font cartridges or "soft" fonts. The former are immediately available to the printer when plugged in, while the latter are stored on your computer disk(s) and must be downloaded to the printer for printing jobs. Fonts cost between $100 and $500 each. An office word-processing environment might need as few as one or two extra fonts, while a desktop-publishing environment might need many.

The HP LaserJet can also do graphics, though it has limitations. The standard LaserJet cannot handle a full-page image at the printer's highest quality (or *resolution*). A quarter-page image is usually the largest that can be printed at the highest quality. Upgrades for the HP LaserJet family enable reproduction of full-page images and graphs at the highest resolution, but these can be expensive. Lines and shaded areas are easily created, but more complex figures can be constructed only from straight line-segments. The HP LaserJet's speed is one of its main strengths. Unlike many laser printers, it prints pages at nearly the rated speed of the print engine. (To understand the workings of a laser printer, see the preceding article.)

Near the top of the scale in the laser printer market are PostScript printers. PostScript devices include the Apple LaserWriter, the LaserWriter Plus, the LaserWriter IINT, the LaserWriter IINTX, the QMS PS800, the QMS PS800+, the QMS PS800 II, the QMS 2400, and the NEC SilentWriter LC890, to name but a few. These printers are governed by PostScript, a programming language that printers can understand. (For more about the language itself, see the next article.)

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PostScript's main advantage is probably its font-handling capabilities. Fonts are represented by a mathematical description of each character in the font. Normal mathematical operations can be performed on these descriptions. Most importantly, characters can be mathematically scaled larger or smaller. PostScript printers contain 35 or more fonts. Although 35 fonts may not at first glance be a huge selection, each of these can in fact be scaled to any size. So, while the HP LaserJet required you to purchase different sizes of fonts separately, with a PostScript printer you get *all* sizes of each of the built-in fonts. Size scaling from 1 point (1/72 of an inch) up to *any* size is possible. You can also purchase extra fonts; any operation possible with the built-in fonts is possible with these downloaded fonts.

Each font can also be rotated to print in landscape or portrait orientation, or to print at any angle on the page. Text can even be made to follow a wandering or geometric path along the page. PostScript printers also have excellent graphics capabilities. Simple PostScript commands exist to draw complex curves, lines, shaded areas, and other patterns. The printer treats graphics (e.g., circles) as objects. If you want a circle, tell the printer where on the page you want it and how big you want it. The printer itself figures out which areas on the page should be blackened.

Another feature of PostScript printers is compatability with photographic typesetters. UTCS has a Linotronic L100 PostScript typesetter (see box on page 6), and the same output that was sent to the PostScript laser printer can be sent to this typesetter, producing the same output at much higher quality. This compatibility reduces the cost of typesetting; you proof from inexpensive laser printer output *before* sending your job to the typesetter. PostScript is rich in functions related to both typography and programming; it makes kerning of text relatively easy, for example. Other graphical functions make complex graphics easy to produce as well.

One disadvantage of PostScript printers is that some software is incompatible with them. All Apple Macintosh software is compatible, but not all programs in the IBM world support PostScript. Fortunately, the major word-processing packages in use on campus do work with PostScript printers, and virtually all desktop-publishing software provides PostScript support.

Another disadvantage of PostScript printers is their cost. A base LaserJet-type printer costs approximately $3000, while a base PostScript printer costs around $6000. The latter costs more, but of course you also get a lot more. A PostScript printer usually contains a 68000 CPU chip, 1.5 to 2 megabytes (MB) of RAM, and .5 to 1MB of ROM. These components are more than the basic components of a Macintosh *computer.*

PostScript printers also lack the speed of many other printers. This problem stems from the vast amount of work involved in scaling fonts and creating graphic images; the more complex your page, the longer it takes to print. Newer printers use more efficient PostScript, and some use faster (and more expensive) processors. Still, even with the relative slowness, many users are pleased that an affordable printer can print such complex pages! Apple's new LaserWriter IINTX uses a faster processor, and this, Apple claims, can drive the print engine at very nearly its rated speed.

For desktop-publishing and graphics applications, PostScript printers are clearly useful in many ways. For traditional office applications, the print needs might be served well enough with a printer like the HP LaserJet. To find out more on the latest big market release in PostScript laser printers, turn to “Apple's New LaserWriters” on page 7.

What is PostScript?

John Bradley
BRADLEY at UTORONTO

PostScript is the most popular of several page-description languages; these languages tell the printer what to print. *PostScript printers* are those that understand the PostScript language.

Let's consider an illustration of PostScript code. Although this sample won't demonstrate many of PostScript's more powerful features, it will give you some of the flavour of the language. The sample shows some PostScript code and the printed image created by that code. By sending this code from your computer to the printer, you make the printer print the image, as shown.

The first thing you might notice is that PostScript is almost readable. Unlike other command languages, PostScript text need not contain unreadable control sequences. The ASCII text you see in the example is exactly the text you would send to the printer. In fact, all printing (including the printing of non-ASCII characters) is controlled by the standard ASCII character set. Although in the example we split the text into separate lines, this isn't necessary.

As you can see, the image in the example consists of a box and some text. The PostScript code first indicates how to draw the box and then describes the text display.

Drawing the Box

The first command, **newpath**, tells the printer that we are going to draw a figure by specifying a path that outlines it. We then indicate the starting point on our path: **270 360 moveto**. Like all PostScript commands, this one first gives the information the printer will need to carry out the command (in the example, the numbers "270" and "360") and then tells the printer what to do with that information ("moveto"). The starting position is defined in *points* (one point is 1/72 of an inch) and is specified with the two numbers. In this case, we indicate a position 270 points from the side and 360 points from the bottom of the page.

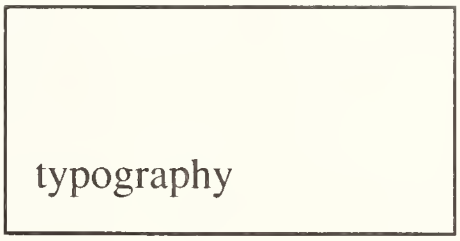
The next statement in the example, **0 72 rlineto**, tells the printer that the first part of the path extends from the current position (specified above) to a new position 0 points to the right, and 72 points higher on the page — in other words, a vertical line one inch long. Next, **144 0 rlineto** specifies another line ending 144 points (2 inches) to the right, and 0 points higher on the page. A third line, **0 -72 rlineto**, extends the path down one inch. Now **closepath** asks the printer to close the path by drawing a line from the current point across to the first point. Finally, **stroke** asks it to draw an actual line along this path.

Displaying the Text

The code next specifies how to display the text. First comes a starting point for the text: **280 370 moveto**. The command **/Times-Roman findfont** tells the printer to find its Times-Roman font. All PostScript printers have the Times-Roman font built in. A simple reference to it, as we have here, will access this built-in version. Then, **14 scalefont** tells the printer to print the text at a point size of 14. In PostScript printers, fonts can be described as shapes. The printer can scale these to different sizes on request. (Because PostScript printers have professional-quality built-in fonts as well as a good assortment of professional-quality downloadable fonts available, and because these can be used in pretty well any size or orientation, these printers are very attractive to the graphic arts industry.)

continued...

```
newpath
270 360 moveto
0 72 rlineto
144 0 rlineto
0 -72 rlineto
closepath
stroke
280 370 moveto
/Times-Roman findfont
14 scalefont
setfont
(typography) show
showpage
```



Now that we've created the font in the style and size we want, we use **setfont** to tell the printer to use the font. The command **(typography) show** makes the printer display the text "typography" in the chosen font (14 point Times-Roman), starting at the "280 370" position.

Finally, **showpage** tells the printer to print the finished page.

PostScript is designed to display text and graphics, and is, in fact, a full programming language — similar to the language FORTH. Like other programming languages, it has variables, procedures, and the ability to do arithmetic and to make basic logical decisions.

Usually, you won't have to produce PostScript code directly. Your word-processing or desktop-publishing program produces the code when you print on a PostScript printer. For example, Microsoft Word or PageMaker takes the text and layout information from your document, converts it into PostScript code, and sends it to the printer.

Printing at UTCS

Printing devices available:

- 1 Xerox 8700 Laser Printer (300 dots per inch *(dpi)*, 70 pages per minute *(ppm)*)
- 1 Apple LaserWriter PostScript laser printer (300 dpi, 2-4 ppm in general, to a maximum 8 ppm)
- 2 QMS PS800+ PostScript laser printers (300 dpi, 2-4 ppm in general, to a maximum 8 ppm)
- 1 Linotronic L100 PostScript typesetter (1270 dpi, .3 ppm)
- 1 IBM 1403 impact printer (1200 lines per minute)

Access:

Microcomputer users can print on the **Xerox 8700** and *all* PostScript devices. The **Xerox 8700** produces good quality laser printer output with the same printing capabilities as a daisy-wheel printer. Higher quality output and vastly superior printing capabilities are available on *any* of the PostScript devices (**Apple LaserWriter, QMS PS800+, or Linotronic typesetter**). PostScript devices can usually print anything produced by your word processor or desktop-publishing software. (For information on PostScript, see "Laser Printers: A Basic Choice" and "What is PostScript?" elsewhere in this issue.)

Mainframe users can use all of UTCS' printing devices. Regular listings can be sent to any of the devices from GP UNIX, CMS, TSO, or WYLBUR. SAS/GRAPH files from CMS, TSO, and WYLBUR can be sent to the PostScript devices, which will produce very sharp, clear, reproducible output. Any applications on the UTCS IBM or UNIX machines that produce PostScript can also access the PostScript devices.

If your machine is on the campus network, it is possible to arrange easy access to our PostScript devices, as if they were directly attached to the machine. This is particularly useful for people who want to proof on a local PostScript laser printer and need typesetter output for final copy.

For help with printing, or for more information, please contact UTCS Advising Services at 978-HELP.

Apple's New LaserWriters

John Bradley
BRADLEY at UTORONTO

Well, it had to happen! In January, Apple announced replacements for their LaserWriter printers. The LaserWriter family began in 1985 with the base Apple LaserWriter and continued with the introduction of the LaserWriter Plus. The new printers–called LaserWriter IIs–extend this family in several ways. One of the printers, the IISC, is evidence of a minor change in direction at Apple.

New developments in printer technology led to Apple's change. The old LaserWriter and the Plus contain Canon's CX model print engines. Over a year ago, Canon announced the new SX print engine to replace the CX model, and said that they would discontinue the old line. This move forced all laser-printer manufacturers who used the CX to replace it. Hewlett-Packard, with the CX-based LaserJet, announced their new SX model about a year ago. It was clear that Apple would eventually have to do the same.

Three Family Members

Three printers comprise the new LaserWriter family–the IINT (pronounced *two N T*), the IINTX, and the IISC. All contain Canon's IISX engine. The IINTX and IINT, like the original LaserWriters, are PostScript printers. The IISC, on the other hand, is the first non-PostScript laser printer to be released by Apple. Upgrades between models are possible. That is, the IISC (the least expensive) can be converted into a IINT, and a IINT can be converted into a IINTX. The essentials, extracted from the Apple announcements, are summarized in the table on page 9. For now, let's talk about the significance of some parts of the announcements. The views expressed here are based on information in several of the journals and announcements, and on some experience with the IINT, the only model available when this article was written.

The LaserWriter IINT

This machine essentially replaces the LaserWriter Plus. The main difference is in the new print engine. Like the Plus, the IINT can run under Appletalk, or it can be connected to the computer via a serial port. The Appletalk connector allows the printer to be shared by several Macintoshes (the NT stands for Network). It also contains the Plus' 35 PostScript fonts. As it has somewhat more memory than the Plus, you can expect it to be slightly faster. In general, however, it still cannot print at the SX's maximum throughput of eight pages per minute.

The LaserWriter IINTX

This machine is a more advanced version of the LaserWriter IINT. The important extensions are:

- The processor in the printer is the faster 68020. Apple claims that this printer can print eight reasonably complex pages per minute. If so, this printer is significantly faster than the IINT and almost every other PostScript printer available.
- The printer has expansion slots and a SCSI interface, which lets you add a hard disk to your printer. This means you can permanently download fonts to the printer and store them on the hard disk, or you can install fonts via the expansion slots. Then, whenever you ask for these fonts, the printer will use them as if they were built in. At this point, Apple has not proposed other uses for either the SCSI interface or the expansion slots.
- Perhaps surprisingly, Apple has also added Hewlett-Packard LaserJet II emulation to this printer. This is of little or no use to the Macintosh buyer, as there is no software on the Mac that can drive an HP LaserJet. The option might increase this printer's popularity with IBM users, however.

The LaserWriter IISC

The IISC is significantly different from the other two printers. Although it is identical in appearance, is built on the same print engine, and can be upgraded to the IINT or IINTX, it is *not* a PostScript printer. This makes it unlike all other Apple laser printers–the NT, the NTX, and the older LaserWriters.

The IISC is advertised by Apple as a "QuickDraw printer." QuickDraw is the basic graphics language used inside the Macintosh. All images you see on your screen are described inside the Macintosh in QuickDraw. With the IISC, Apple provides a driver that takes a QuickDraw description of what you want to print and

continued...

converts it into a bit-mapped image. This image is shipped to the IISC, which then prints it. Using QuickDraw in this way is important for several reasons:

- Perhaps most importantly for Apple, this printer costs much less to make than PostScript printers, since the PostScript license fee is saved. This fee (paid to PostScript's developers) is rumoured to be about US$1000 per printer and is the principle reason why PostScript printers are much more costly than non-PostScript printers. It is partly because Apple doesn't pay this fee for the IISC, that it is the least expensive of the three printers.

- A larger portion of the computational burden of printing a document is put on your Macintosh. The printing speed is thus influenced by the power of the Macintosh model you are using. The powerful Mac II, for example, will make the IISC print significantly faster than a Mac SE.

- When bit-mapped information is to be printed, a lot of material must be passed between the computer and the printer. To handle this information, the IISC is connected to your Macintosh using the SCSI interface and *cannot* be shared among several different Macintoshes as can the IINT and the IINTX.

- The fonts used by the IISC are essentially the same as your screen fonts. For complex reasons (we won't discuss them here), this results in somewhat less attractive printing of text. For most applications other than desktop publishing, the print quality is expected to be adequate.

- The IISC can be driven exclusively by the Macintosh, as QuickDraw and the QuickDraw IISC driver are available only on Macintosh machines. No IBM software can drive the IISC at the moment, although IBM computers can drive PostScript printers (including the IINT and the IINTX).

The SX Printing Engine

The new LaserWriters are all built around the same SX printing engine. Canon, drawing upon their experience with the widely used, very successful CX engine, changed several aspects of their print engines when designing the SX. These changes have resulted in some major differences between the old and new printers:

- The print engine is designed to last for about 300,000 pages. The old CX had a rated lifetime of only 100,000. This might reduce overall costs.

- The new engine is smaller and lighter.

- The new engine is less expensive. Printers built on these engines are likely to cost a little less.

- The cartridge is entirely new. Somewhat less expensive, it lasts a little longer–it's rated at 4000 pages rather than 3000. CX print cartridges cannot be used in the new printers.

- Paper normally comes out of the SX printer face-down. This means that output prints in the correct order, with the last page at the bottom. On the CX printers, output normally comes out face-up, causing the last printed page to end up on top.

- The new engine provides improved support for printing on nonstandard papers, such as envelopes.

- Canon has increased the size of the printed dots. This results in blacker blacks, but in some cases also produces coarser printing.

This last change has caused some controversy. The *Seybold Report on Desktop Publishing,* in a recent review of the new LaserWriter line, maintains that the larger dot size in the SX causes it to print text less attractively. *Seybold* considers this a serious problem, if the printer is to be used as a publishing tool. The CX engine was particularly successful in printing text, partly because of the small dot size. With the SX engine, *Seybold* believes, text printing-quality has been somewhat compromised in the interest of better graphics printing-quality.

Apple Canada has kindly placed a LaserWriter IINT in the University (see the following article, "Apple Research Partnership Program"). When testing the IINT, we could see that the print image is slightly different from that produced by the CX-based printers. The blacker blacks are pleasing in graphics that contain large black areas. On our machine though, we noticed some "ghosting," as the black areas did not print uniformly. We did notice a small reduction in the quality of text printing but suspect that many potential users would find the quality adequate. The larger dot size also seemed to affect the printing of darker grey-shaded areas–some were indistinguishable from true black.

continued on page 10

LaserWriter and LaserWriter II Compared at a Glance

LaserWriter Model		Plus	IISC	IINT	IINTX
Suggested Retail			$4,479	$7,359	$10,599
Availability	discont	discont	February	January	February
Print Engine					
Type	Canon LBP-CX	Canon LBP-CX	Canon LBP-SX	Canon LBP-SX	Canon LBP-SX
Speed Max (ppm)[1]	8	8	8	8	8
Speed Average[2] (ppm)	1.5-2	1.5-2	2-4	2-4	6-8
Quality (dpi)[3]	full 300	full 300	full 300	full 300	full 300
Recommended Duty					
Max (page/month)	4,000	4,000	unlimited	unlimited	unlimited
Life (pages)	100,000	100,000	300,000	300,000	300,000
Printable Area					
Letter (inches)	8.0×10.92	8.0×10.92	8.0×10.5	8.0×10.5	8.0×10.5
Legal (inches)	6.75×13.0	6.75×13.0	8.0×13.0	8.0×13.0	8.0×13.0
A4 (inches)	7.41×10.86	7.41×10.86	7.41×10.86	7.41×10.86	7.41×10.86
B5 (inches)	7.69×10.16	7.41×10.86	7.69×10.16	7.69×10.16	7.69×10.16
Processor					
Type	68000	68000	68000	68000	68020
Clock Rate (MHz)	12	12	7.45	12	16.67
RAM	1.5 MB	1.5 MB	1.0 MB	2.0 MB	2.0 MB[4]
ROM	0.5 MB	1.0 MB	16.0 KB	1.0 MB	1.0 MB[5]
Print Protocols					
PostScript	yes	yes	no	yes	yes
Diablo® 630 subset	yes	yes	no	yes	yes
HP LaserJet Plus	no	no	no	no	yes
Built-in Fonts					
Families	4	11	none[6]	11	11
Typefaces	13	35	n/a	35	35
Print Interfaces					
SCSI	no	no	yes	no	no
AppleTalk	yes	yes	no	yes	yes
RS232C	yes	yes	no	yes	yes
Peripheral Interfaces					
SCSI	no	no	no	no	yes[7]
ADB™	no	no	yes[8]	yes[8]	yes[8]
Physical					
W×D×H (cm)	47.0×41.2×29.2	47.0×41.2×29.2	50.8×47×21.8	50.8×47×21.8	50.8×47×21.8
Weight (kg)	35	35	20	20	20

[1] Pages per minute.
[2] Range is for "average" mix of text and graphics. Actual rate depends on complexity and mix.
[3] Dots per inch.
[4] The IINTX allows RAM expansion up to 12 megabytes.
[5] The IINTX allows ROM expansion via a font expansion slot.
[6] The SC does not have any built-in fonts. Instead fonts in your Macintosh System file are used.
[7] The IINTX has a SCSI port for hard-disk storage. This can be used to store additional downloaded fonts.
[8] The Apple Desktop Bus (ADB) is there for future use. For example, a computer-controlable sheet feeder could use it.

This table was prepared by Alex Nishri, from information supplied by Apple Computer.

Apple's New LaserWriters continued.

The Significance of the IISC Printer

The Apple LaserWriter made PostScript prominent in the publishing world. With the LaserWriter, the computer user for the first time got relatively inexpensive access to very high quality output. Why, then, has Apple announced the QuickDraw IISC?

This question has received wide attention in the trade publications. Most people attribute Apple's decision to the cost factor. Apple did not create PostScript and must still pay that hefty license fee to Adobe (the developer of PostScript). This has kept them from competing in the low end of the market for PC laser printers–a market dominated by non-Apple, non-PostScript products such as the Hewlett-Packard LaserJet and printers even less expensive. Further, some Macintosh buyers felt penalized by the restriction to an expensive laser printer containing features they believed they didn't need.

With the IISC, Apple can produce a much lower-priced laser printer for Macintosh users who need laser printing but don't need the very high quality product of PostScript printers. Besides, since Apple is strongly committed to QuickDraw as the graphics-description language of choice inside their computers, it makes sense to produce a printer that fits naturally into this environment.

The IISC represents for Apple, we believe, a slightly diminished commitment to PostScript. However, the fact that two of their three printers are PostScript devices indicates that Apple still sees PostScript as an important part of their future.

Apple Research Partnership Program

Geoffrey Rockwell
rockwell@gpu.utcs.toronto.edu

The Apple Research Partnership Program (ARPP) was formed in the spring of 1987 by Apple Canada to encourage original research with Apple Macintosh computers. Twenty nine students, lecturers, and other members of the university community were chosen from six universities across Canada to participate in this program. The idea is to bring together and train a diverse group of enthusiasts who are actually part of the university community and hence are sympathetic to its problems and needs. Now, we are not only pursuing projects of our own but also helping other members of the university who want to do work with Macintoshes. We have been given access to information and powerful tools with which to help you develop interesting applications. We are, above all, information conduits, having access both to people at Apple and to the resources of UTCS. If you have any questions, problems, or are simply in need of inspiration, come talk to us.

Who are the ARPP people at the University of Toronto? **Geoffrey Rockwell** is a doctoral student in Philosophy. He is interested in applications for the humanities, desktop publishing, and the creation of tools for research and teaching. **Eddy Wong** is with Pharmacology, where he is currently working on simulating drug tests so that information can be obtained before subjecting large numbers of people to a new drug. Eddy also works for UTCS Advising Services and has gained experience helping the U of T community with applications. He is also experienced with UNIX, C, and hardware-design issues. Currently Eddy is putting together an easy-to-use electronic mail program so that people unfamiliar with UNIX can send and receive electronic mail directly from a Macintosh. Eddy is also pursuing the various CAD-CAM packages on the Macintosh to see which are best suited for academic use. **Nikki Yokokura** is a lecturer with the East Asian Studies department. She is interested in Japanese applications on the Macintosh and in the development of courseware. She also has experience in animation on the Macintosh. Presently Nikki is building an animation piece that will demonstrate the origin of the various Kanji characters. The animation is accompanied by digitized sound, allowing you to hear Japanese words using the particular Kanji character while you watch the animation for that character. **Jennifer Boldt** is a student in the program Art as Applied to Medicine.

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The department is actively involved in medical communication in both hospitals and universities. Through the use of the computer and software programs for animation, 3D imaging, and HyperCard stacks, she hopes to demonstrate new methods to present medical information. She is also interested in practical applications in the institutional setting. Currently Jennifer is working on setting up an animated demonstration of a blood capillary, showing the lumin being constricted by the protocyte cells and the fenestrations opening and closing to allow passing of selected molecules. Jennifer is using photographs taken from an electron microscope, which can take only still pictures.

The ARPP office is located in the UTCS Advising Consultants area, Room 213, 4 Bancroft Avenue. Apple has equipped the office with a Macintosh II, a Macintosh SE, a LaserWriter IINT, software, and reference documentation. We welcome you to drop by and get acquainted. One of us will be always be available between 10:00 a.m. and noon, Tuesday through Friday, or you can give us a call at 978-7828 to arrange an appointment at your convenience.

Protect Your Data from Viruses

Terry Sanderson
SANDERS at UTORONTO

Computer users **BEWARE!** New "Trojan Horse" programs, designed to **destroy the data** of unaware users, are circulating in the PC environment.

Created by malevolent, irresponsible people, these programs are usually disguised as copies of the more popular public-domain programs, or as user-supported shareware. When executed, they attempt to delete the information on your disks, usually by overwriting the Root directory and the File Allocation Table (FAT). Recovering your data *may* be possible after this has happened, but if the program has also written over your data space, your data is probably lost.

The most recent type of Trojan Horse program is dubbed a **virus**. It is so named because it copies itself to other disks several times before it destroys your data, thus spreading the infection. Since people would become suspicious if an unfamiliar program started appearing on all their floppy disks, the programs' creators have gone to great lengths to disguise them. The most popular PC virus lives in the file COMMAND.COM, which appears on all bootable disks. Since the virus does not change the Directory listing of the file, it is very difficult for the average user to discover that a disk is infected.

When a machine is booted from an infected disk, the virus waits for the execution of a DOS command (such as DIR or CLS). Then the virus code takes over; it looks for and infects copies of COMMAND.COM on other disk drives attached to the machine. When the virus has replicated itself four times, it destroys all the data on any accessible disks.

Variations on this virus have infected PC programs in Israel. One of these attaches to any COM or EXE file that is executed, extending the file's length by 1808 bytes. This particular virus has a flaw: it infects EXE files at *each* execution, and thus at some point either fills the disk (which prevents further infection), or the EXE files become too large to load into memory. Despite the flaw, the program is designed to infect files until the next Friday-the-13th. It will then delete all COM or EXE files executed on that date.

Take a FLU_SHOT

Certain programs available on the UTCS Bulletin Board System (BBS) can help prevent the loss of data and the spread of viruses. Firstly, a program called FLU_SHOT, designed to watch for writes to COMMAND.COM, can be placed in the AUTOEXEC.BAT file of boot disks. When writes are attempted (which should never happen), FLU_SHOT informs you and gives you the option of aborting the attempt. An updated version checks for other "illegal" actions and will be posted when it is available.

A second program, STRINGS, can display all ASCII strings in a COM or EXE file. This may help you spot anomalies, because the people who create viruses often include sardonic messages like "Gotcha," which appear while the virus reformats your hard disk.

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Finally, for more advanced users, INTCHAIN checks for modifications to the interrupt vectors. It can also display which programs steal particular interrupt vectors.

Protect Yourself

You can also take the following precautions to protect yourself and others from Trojan Horse programs.

1. **ALWAYS make backups** of all important data. Too many times people say, "But this is the first time I didn't make a backup!" One incident of data loss is enough to make people realize the value of their own time. Also, all backup diskettes should be write-protected.

2. **NEVER execute a program** unless you are **absolutely** sure of what it does and where it came from. Since most Trojan Horse programs are distributed on public BBSs, download files from well known, reputable systems only.

3. **TEST programs thoroughly** before distributing them to your friends and coworkers. A well disguised Trojan Horse may hide itself for months, but careful testing and observation can uncover flawed ones. Always be wary of mysterious or modified files.

4. Purchase software such as the Norton Utilities or Mace, which provide programs that let you unformat a hard disk (the programs keep a copy of both the FAT and Root directory and can restore them if necessary). As an added benefit, these can also help when *you* accidentally reformat your hard disk.

An "Astonishing" Information-Delivery System

Mark Vanderkam
PUBSCOOP at UTORONTO

Nine hundred years ago, computer technology was too undeveloped to help in the survey of William the Conqueror's kingdom. His scribes used quill pens and parchment instead, producing the famous Domesday Book (pronounced *Doomsday*). Using a recently developed system called "Advanced Interactive Video" (AIV), modern scribes have created a fascinating *electronic* survey of the United Kingdom, the highly acclaimed Domesday Project.

With a microcomputer, monitor, and the Domesday video discs, you can actually explore the United Kingdom. For example, you can walk about the country. First look at a map of the entire kingdom (here the computer uses Ordnance Survey maps stored on the discs), then zoom in on a particular country, then peer over the map of a certain area or city, and finally examine a fairly detailed street map of your point of interest. As you go through the levels of the maps, you can also look at satellite photographs and landscape shots of your area. Text directories linked to each map give access to short essays (done by schoolchildren) on facets of local life. You can also use place names or grid-reference points to zero in on areas, or specify keywords or place names to search for related information (e.g., the number of pensioners or church-goers in Coventry).

You can also take other walks. Look on the screen at photographs of a city street, a Scottish wilderness, an English cottage, or several other subjects, indicate in which direction you would like to turn or walk, and new photos of the next view appear. As you walk about, you can look inside cupboards, examine license plates, study a bog or tree, or look at many possible views of your area. Domesday also provides a gallery on life in the U.K. You can walk into rooms on culture, nature, royalty (of course), or a variety of other studies. Once in the room, you see that the walls are hung with photographs. Approach a hanging and tell the computer to open it, and the picture is replaced with a slide show on that person or subject.

Apart from regional facts, Domesday also uses several extensive national surveys and other sources to give data on culture, society, the environment, and the economy. Furthermore, there are sixty video minutes of British news in the 1980s, as well as the tens of

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thousands of still photos on every aspect of life in the U.K.

The Domesday Project is an informational portrait of the United Kingdom, incorporating 55,500 still photographs, 24,000 Ordnance Survey maps, 250,000 place names, 9700 sets of data, 60 minutes of video footage, and 150,000 screen pages of text — all compiled by the BBC over a two-year period, at a cost of £3 million. This information, the equivalent of two sets of the *Encylopaedia Britannica*, is contained on two video discs. Video discs are used because of their immense storage capabilities. Domesday contains enough information to keep a person busy viewing and reading from it for 40 hours a week, for seven years.

The manufacturer of Domesday claims that "so much information" has never before been accessible in such a small, easy-to-use format. Using readily available equipment, the BBC has developed this affordable system for making large amounts of data available to untrained computer users. In February, dozens of interested computer users, educators, and computer-system professionals crowded into a UTCS Education Facility to see demonstrations of this trailbreaking information-retrieval and delivery system.

The System

Shimmering video discs, the size of LP records, contain the control programs and database around which this Advanced Interactive Video System is constructed. A single disc can hold 324 megabytes (MB) of digital data per side, plus 54,000 analogue video frames. The computer organizes the data in hierarchical tiers, allowing the user to access *levels* of information. This way, you can begin at a more general level and "home in" on more specific datasets.

Once the disc is placed in the player, you can find the information in several ways, depending on the arrangement of the data. For example, you could type in a keyword, in order to search topics. The computer then provides a list of datasets. The data, available at the tap of a button, could consist of text, audio, video, still photographs, graphs, charts, maps, or a combination of these.

This AIV System is based on a BBC Master Series AIV Microcomputer, which works with a peripheral Laser Vision Disc Player, video discs, and an analogue RGB colour monitor. The AIV System is designed to allow interested people to use available programs, or to produce interactive video programs of their own. Dorothy Netherwood, Olivetti's AIV demonstrator (Olivetti's British education branch, Acorn, largely contributed to the creation of this System), described AIV as "truly astonishing," and "a very innovative and exciting way to present information." The System was set up at UTCS' Micro Lab for a week, and many groups and individuals came in after the demos, to experience AIV personally.

Though AIV puts such a huge amount of data at your fingertips, it is extremely easy to use. Every school board in the United Kingdom has already bought AIV, giving school children an opportunity to try it. Since school children had contributed tens of thousands of essays to Domesday, to give a "snapshot" of life in the U.K., they were able to view their own projects on the computer when the System became available.

The Great Potential of AIV

The benefits of AIV are manifold. Unlike books, the video discs are very durable. The discs are scanned by a laser, which can never harm them, and are coated in heavy plastic for protection against physical abuse. This inexpensive method of information handling could obviously be useful in many other fields. If the University of Toronto had an AIV "map" of the campus, you could find, for example, the Bancroft Building very easily. You could sit down at a terminal, tell the computer where you want to go, and photographs, street maps, video footage, and bus schedules would appear to show you the building and its exact location. Restaurant owners could put a terminal in a hotel lobby, and visitors could easily read their menus, see the clientele, view the food, and even meet the kitchen staff!

To help users customize Domesday to their needs, the BBC has introduced DataMerge, which allows you to add your own data. The BBC has also produced an information disc on the ecology, called ECODISC. This is designed to let senior high school and first year university students create five-year plans for controlling ecosystems. ECODISC reportedly allows students to view a wetland habitat from many different angles. You could look at maps, stills (winter or summer shots of the same views are provided, as well as underwater and microscopic views), or video, put radio collars on animals to trace their movements, consider letters and information sent in by wildlife groups, industrialists, and concerned citizens, seek advice from experts, and then work toward managing the system. A disc on volcanoes is expected soon.

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Domesday uses such an effective method of information technology that many others, including Israel, the Scandinavian countries, the European Economic Community, Australia, and Canada are now interested in doing similar projects.

The only limit to AIV is the amount of information that is placed on the discs. Domesday cost close to $7 million and had one million contributors, many of them volunteers. Even with such resources, the Project has limitations on information. Each of the 23,000 twelve-square-kilometre blocks is linked to a maximum of three photos, a 67-element table of data, and 20 screen pages of text. London has very little information on it, because the school teachers were on strike during the making of Domesday. Thus the children could not do the "local colour writing" that children did on the rest of the U.K. For people with the resources though, AIV could be a good system to work in, allowing you to create highly detailed, multimedia electronic "maps" and information sources.

Moving Lotus 1-2-3 Spreadsheets into SAS/PC

Ihor Prociuk
IHOR at UTORONTO

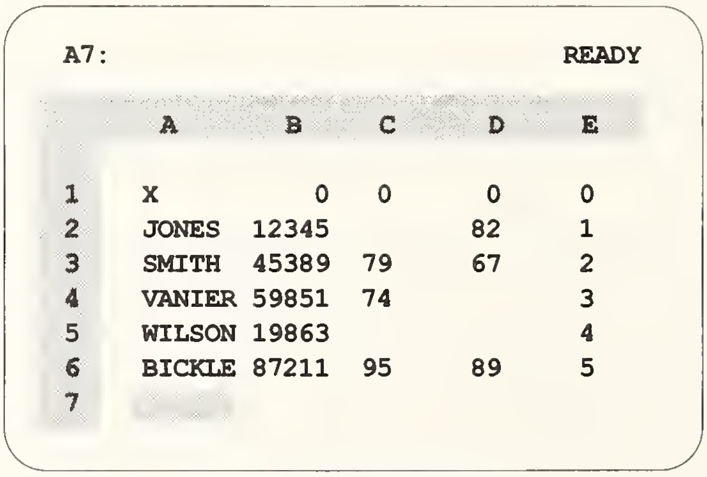
SAS/PC has the ability to read Lotus 1-2-3 spreadsheets if they are translated into a special format called DIF (Data Interchange Format). However, you should make a few changes to your spreadsheet for the data to be converted properly into SAS variables.

Begin by making a copy of the spreadsheet you want to convert to SAS. Make the following changes to this copy:

1. Remove all text that is not to be converted to SAS variables. This includes such things as titles, other descriptive text (e.g., documentation), and printer controls. Delete also any blank rows and columns.

2. The *first row* of your spreadsheet *must* have a value in every column that is to be converted to a SAS variable, otherwise errors can occur.

Here is an example. The figure below is a simple 1-2-3 spreadsheet. Column A is the student name, column B is the student number, column C is the result of the first test, column D is the result of the second test, and column E contains sequence numbers (this column is required and is discussed in item 3 below).



```
A7:                                   READY

       A        B      C      D      E

1    X            0    0      0      0
2    JONES   12345           82      1
3    SMITH   45389   79      67      2
4    VANIER  59851   74              3
5    WILSON  19863                   4
6    BICKLE  87211   95      89      5
7
```

Lotus 1-2-3 Spreadsheet

When 1-2-3 translates the spreadsheet into DIF format, it will indicate that cell C2 (JONES missed the first test) is an empty *text* string. Now suppose for a moment that row 1 is not present. When SAS reads in the DIF file, it uses the first row to set the variable type (character or numeric). It would thus set the variable in column C to character type. This is not correct and causes errors in SAS. Putting in a dummy row 1, with each column containing dummy entries of the correct type, makes SAS convert the data in *subsequent* rows correctly. This dummy observation can then be deleted from the SAS data base.

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To avoid these problems, insert a dummy first row that would have, say, a student name of X, a student number of zero, and entries of zero for the first and second tests. This observation can be deleted when the SAS data set is created.

We're not quite finished. One other situation can cause errors in conversion from DIF format to SAS data bases.

3. To account for missing values properly, you have two choices: either indicate missing test scores with a period (or some other value, like -99) or insert a column of sequence numbers, as in column E. You could use the 1-2-3 /Data Fill command for this purpose.

   While the first choice will work, it does mean that you must enter some sort of missing-value indicator for all missing test scores. This may interfere with other calculations taking place in the spreadsheet.

   If the column of sequence numbers were not present, rows that contain trailing missing test scores (rows with no values in column D or columns C and D) would not be properly accounted for in the DIF file, and the conversion to SAS would be incorrect. Inserting a column of sequence numbers to the right of the test scores ensures that missing test scores are handled correctly, and consequently the SAS conversion works correctly. The variable generated by column E can be dropped from the SAS data base after the conversion.

The next steps in the conversion are as follows:

4. Use the 1-2-3 command /File Xtract Values to extract (and save in a separate spreadsheet) only those rows and columns that make up the data you want converted (in our example, these would be columns A through E). The Values option tells 1-2-3 to save all formulas and functions as their evaluated values.

5. Use the 1-2-3 /Quit command to exit from the current spreadsheet. This returns you either to the DOS prompt (if you started 1-2-3 by typing *1-2-3*) or to the 1-2-3 Access System (if you normally start 1-2-3 by typing *lotus*). Select the Translate option in the 1-2-3 Access System (those in DOS first need to type *lotus*). Select the options that translate *from* 1-2-3 *to* DIF format. If the extracted worksheet produced in step 3 above was named TOSAS.WK1, then the DIF formatted file is called TOSAS.DIF.

6. Leave the Access System completely and get to DOS. Start SAS and use the DIF procedure to convert the TOSAS.DIF file to a SAS data base. Documentation on how to use the DIF procedure can be found in the *SAS Procedures Guide Version 6* (and later).

The conversion results in a SAS data base with variable names like COL1, COL2,...,COLn. Remember to drop the dummy variable created in step 3 (column E of the Lotus spreadsheet) above and the first dummy observation created in step 2.

An excellent article on the structure of DIF files can be found in the June 1987 issue of *Lotus Magazine* (available at the UTCS Information Centre, 4 Bancroft Avenue).

University of Toronto Computing Services

Hours of Service

Good Friday and Easter
(April 1,2,3, 1988)

The hours of service for the above holiday weekend will be announced via system Broadcast and HOTNEWS messages closer to the holiday.

Notes for SAS/GRAPH Users

Terry Jones
TJ at UTORONTO

Preview Mainframe Graphics on Your PC

If you have an IBM PC with a modem and graphics display and you are using SAS/GRAPH on CMS or TSO, you can now display your SAS/GRAPH output on your PC before committing it to print.

The latest release of Kermit for the IBM PC (2.30) simulates a VT100 terminal for normal use, but it can also act like a Tektronix 4010 graphics terminal. This gives you the ease and familiarity of VT100 editing and the convenience of checking your plots immediately on screen, using the Tektronix 4010 emulation.

A simple SAS/GRAPH statement is all that's needed to make the operation automatic:

```
GOPTIONS DEVICE=TEK4010 NOCHARACTERS
     GPROLOG='1B0C'X   GEPILOG='18'X;
```

Then any graphics output will be sent to your screen, and the terminal will automatically switch between Tektronix and VT100 modes at the appropriate times (this is the function of the GPROLOG and GEPILOG). The NOCHARACTERS option forces SAS to *draw* all text, rather than use the normal PC screen characters. This takes longer but represents more accurately how the actual plot will look when sent to a printer. (To see the difference, try using the CHARACTERS option instead.) The GOPTIONS statement need be issued only once at the beginning of the SAS program/session; it remains in effect until explicitly changed.

The UTCS Advising Office, located in Room 201, 4 Bancroft Avenue, will have the new version of Kermit soon. Just bring in a couple of formatted floppy disks (5.25" or 3.5") and ask for a copy.

Laser Printer Output of SAS/GRAPH

Some SAS users on CMS, WYLBUR, or TSO may not know that graphs may be plotted on a PostScript laser printer at the Information Centre (Room 201, 4 Bancroft Avenue). This printer produces very sharp, clear, black-and-white SAS/GRAPH output on 8.5 x 11-inch plain paper.

The SAS statement

```
GOPTIONS DEVICE=PS300;
```

tells SAS to use the UTCS SAS/GRAPH driver for PostScript (PS) printers. (This is a locally-written driver.)

continued on page 17.

Change Committee

Beverly Scarborough

Changes to Academic MVS Machine Services

1. WATFOR77 1.5 was made production, WATFOR77 1.3 was made backup, and WATFOR77 1.0E was deleted (January 11).

Changes to Academic VM/CMS Machine Services

1. The UTCS collection of Canadian Census tapes was made available, along with some online documentation (January 19).
2. VMACCOUNT was upgraded from R2.1 to R2.3 (January 26).
3. TCP/IP was installed to replace Wiscnet (January 20).

Changes to Other Systems and Services

1. *Login* to notify user of new mail was installed on GPUNIX (December 14, 1987).
2. PSCOMM software was made production (January 27).

Notes for SAS/GRAPH Users continued.

On CMS

Any graphics output is APPENDED to a file on your disk. With interactive SAS, this file is called SASGRAPH PLOTFILE. For Batch SAS runs, the name is <yourfile> PLOTFILE, where <yourfile> is the name given in the SAS command. After exiting SAS, you can send the file to the Information Centre printer with the command

```
SENDPS SASGRAPH PLOTFILE
```

for interactive SAS, or

```
SENDPS yourfile PLOTFILE
```

for Batch users. Remember that the output is *appended* to the PLOTFILE. Make sure you erase the PLOTFILE before you add new plots, or be prepared to see both your old and your new plots when you send the output to the printer!

On TSO and WYLBUR

The "GOPTIONS DEVICE=PS300;" statement ensures that the output is automatically directed to the Information Centre PostScript printer.

For more information on the Kermit Tektronix 4010 emulation or on laser output from SAS/GRAPH, please feel free to call Advising Services at 978-HELP or contact me directly at 978-4924.

SAS/PC 6.03 Has Arrived!

Bill Fehlner
FEHLNER at UTORONTO

The latest version of the SAS system for microcomputers, Version 6.03, arrived in mid-February. The University of Toronto has ordered two new modules, SAS/GRAPH and SAS/FSP, which will be distributed to current license holders along with Base SAS and SAS/STAT. Version 6.03 has many extensions and improvements over 6.02. As a result, it is larger and requires more diskettes for distribution. The four modules, Base, STAT, GRAPH, and FSP, come on 68 diskettes (360K, DSDD, 5.25 inch).

We now have over 150 installations around campus. To reduce both the cost to users and the turnaround time for requesting and installing 6.03, we are using a new method for distributing it. The details vary slightly from the article published in the last issue of *ComputerNews*.

Registered users were notified by mail shortly after we received Version 6.03. Several copies of the installation diskettes are available on 360K 5.25-inch diskettes. Copies are also available on 700K 3.5-inch diskettes. These are available on loan to those who have renewed SAS/PC. New users of SAS/PC will be provided with Version 6.03 from now on. Version 6.02 will continue to function until June 30, 1988, but we encourage you to upgrade well before then.

The table below gives the space required on your hard disk to store each component of SAS/PC. It is not necessary to install components that you know you will not use. For example, not installing SAS/GRAPH and Maps will reduce space requirements by 7 megabytes (MB). We ask you to take only the components that you will use. There will be no difficulty in adding components if your requirements change in the future.

SAS/PC 6.03 Space Requirements

Module	Space
Base SAS without EMS image	5.3 MB
Expanded Memory Specification (EMS)	0.5 MB
SAS/STAT	4.1 MB
SAS/FSP	0.8 MB
SAS/GRAPH without Maps	4.3 MB
Map collection	2.9 MB

Note: The set of Map data sets is included with the SAS/GRAPH diskettes. However, you do not have to install Maps with SAS/GRAPH. Similarly, the EMS image comes with Base SAS but need not be installed.

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Current users should call Dale Wright at 978-4990 to book a set of diskettes on their choice of medium. Please tell her whether you plan to install SAS/FSP and/or SAS/GRAPH at this time. Diskettes can be picked up any time after 10:00 a.m. on the first day of a loan and must be back by 5:00 p.m. on the following day.

You must leave a deposit in the form of an active CAN, a valid appropriation number, or cash. The registered user must also sign an update form. The deposit will be returned when the diskettes and the completed update form are returned on time. The deposit is $25 for each box of diskettes, which represents the cost of a set of diskettes and the staff time required to create them.

If you wish, you may make a backup copy, on your own diskettes, from the distribution diskettes while you have them on loan. Before incurring the added expense, you might consider that distribution sets will be available for immediate loan once the majority of users have completed their update.

We hope this new method of distribution will provide faster and less expensive access to the SAS System on personal computers.

Learning about SAS/PC Version 6.03

The best starting point for learning about SAS/PC 6.03 is the Special Edition of *SAS Communications*; a reference copy is on reserve in the UTCS Information Centre. It describes briefly the new SAS/FSP (Fullscreen Product) and SAS/GRAPH, as well as extensions to SAS/STAT. A free computer-based tutorial is also discussed, and there are two pages describing the new manuals.

Unchanged are the *SAS Introductory Guide for Personal Computers, Version 6 Edition, SAS Language Guide for Personal Computers, Version 6 Edition*, and *SAS Procedures Guide for Personal Computers, Version 6 Edition*. Technical Report P-171 covers all changes to the Base product since these manuals were published, as well as changes to other modules. *SAS/STAT Guide for Personal Computers, Version 6 Edition* is completely rewritten. Other manuals are new with 6.03. These include the *SAS/FSP Guide for Personal Computers, Version 6 Edition* and *SAS/GRAPH Guide for Personal Computers, Version 6 Edition*.

All of these manuals are available for reference at the UTCS Information Centre.

The SAS tutorial is an excellent way to learn to use the SAS display manager. The tutorial is supplied on one of the installation diskettes. All help and documentation are provided within the tutorial itself.

SPSS/PC+ Site License Now at U of T

Bill Fehlner
FEHLNER at UTORONTO

The University of Toronto has joined 16 other post-secondary institutions in Ontario in acquiring a site license for SPSS/PC+. Available to University staff and graduate students for research and teaching, the license includes the Base product, Advanced Statistics, Tables, the Graphics procedure, and the Data Entry module. The annual installation fee for SPSS/PC+ is $100; manuals are purchased separately.

The distribution procedure for SPSS/PC+ will be similar to that for SAS/PC. Several copies of the installation diskettes are available on 360K 5.25-inch diskettes. These are available on loan to users who complete the registration form and indicate a source of funding from either a Departmental Account or a University-administered research grant.

The table below shows approximately how much space each component of SPSS/PC+ requires on your hard disk. You need not install those components you know you will not use. For example, omitting Tables will reduce space requirements by .8 megabytes (MB).

SPSS/PC+ Space Requirements

Module	Space on hard disk
Base	3.4 MB
Advanced Stats	1.5 MB
Tables	0.8 MB
Data Entry	0.9 MB
Graphics	0.3 MB*

*Note that graphics is an interface to one of the following: Microsoft Chart, Chart-master, or GrafTalk. These will take additional space.

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For more information, please call Joyce Bernstein at 978-5128.

Registration forms are available from Dale Wright at the UTCS Information Centre, Room 201, 4 Bancroft Avenue. Once the registration is complete, you may book a date to borrow the installation diskettes. Diskettes may be picked up any time after 10:00 a.m. on the first day of a loan and must be back by 5:00 p.m. on the following day.

You must leave a deposit in the form of an active CAN, a valid appropriation number, or cash. The deposit will be returned when the diskettes are returned on time. The deposit is $40, which represents the cost of a set of diskettes and the staff time required to create them.

If you wish, you may make a backup copy, on your own diskettes, from the distribution diskettes while you have them on loan. Before incurring the added expense, you might consider that distribution sets will be available for immediate loan, should you need to reinstall SPSS/PC+.

ProComm Communications Program Seminar

March 28, 1988
9:00 - 11:00 a.m.

May 25, 1988
9:00 - 11:00 a.m.

ProComm is a general purpose communications program currently available to all U of T faculty, staff, and students. It is the resident communications program in the IBM Education Facility.

A seminar has been scheduled to introduce ProComm and its various features: terminal emulation (a number of popular ones will be reviewed); the dialing directory; file transfer protocols, such as Kermit and XMODEM; configuration and modem parameter settings; and the DOS gateway, which allows you to execute DOS commands and other programs while you are still in ProComm.

A course fee is attached to this seminar. Copies of ProComm are made available at no charge to members of the University, but you must bring your own diskettes (two 5.25" or one 3.5").

To reserve a place in this seminar, please contact Irene Rosiecki at 978-4565.

Free NetNorth (Electronic Mail) Demonstration

March 28, 1988
11:00 a.m.- 12:30 noon

May 25, 1988
11:00 a.m.- 12:30 noon

Anyone interested in sending documents to colleagues or friends reliably, quickly, and inexpensively will not want to miss this demonstration. We will introduce you to the NetNorth/BITNET/EARN communications network, which is accessible from the CMS system. This network connects more than a thousand universities and research institutes in Europe, Asia, and North America. Sending documents or files over the network is very easy to learn.

The demonstration will last just over an hour. Included will be how to send mail and files to another institution, and how to talk directly to someone on the network. ***Please note this is a demonstration only.***

Space is limited. If you would like to attend one of these sessions, please contact Irene Rosiecki at 978-4565 to reserve a place.

MCW and Crowntek Merger

Paul Roth
PROTH at UTORONTO

Crowntek Incorporated has been for some time one of the University's "preferred" suppliers of computer hardware and software. On February 1, Crowntek announced a merger of Crowntek Business Centers division with Microcomputer Warehouse (MCW Computers, Ltd.) to create Crowntek Business Centers. This new company will offer its clients all of the products and value-added services previously available from each party.

To paraphrase the announcement, the new Crowntek Business Centers has annual customer revenues in excess of $150 million, making it Canada's largest supplier of microcomputer hardware, software, and Local Area Networks to the Financial Post 500 companies. The company will be one of the largest buyers and resellers of IBM, Compaq, Hewlett-Packard, and Unisys products in Canada.

From the University's standpoint, this merger could prove significant. MCW is itself a fairly prominent player in the software market in Toronto, and a fair number of people at U of T have dealt with the company for years; MCW's Compaq prices were often the lowest in Toronto. According to a source in the U of T Purchasing Department, the merger "will not adversely affect the University and can only benefit it."

For the next few months, MCW and Crowntek customers should continue to deal with their present sales representatives, calling the same numbers as before. We expect more announcements after the transition period.

Census Tapes Available on VM/CMS

Bill Fehlner
FEHLNER at UTORONTO

Canadian Census data from 1971, 1976, and 1981 is available on magnetic tape at the University of Toronto. These tapes have been accessible from the UTCS-supported MVS system for many years and can now be accessed directly from VM/CMS, both on UTORONTO and UTOREPAS. Details on how to use the census tapes from CMS are provided in a set of online Help files. The command GETME CENSUS links and accesses a minidisk with these Help files. HELP CENSUS MENU then displays the top level of the Help files. The Helps on UTORONTO and UTOREPAS differ only in the method of requesting a tape mount. In addition to these online Helps, users are strongly encouraged to get and read the UTCS Guide to Census Tapes.

In 1984, UTCS produced the Guide to Census Tapes with three purposes in mind. It is primarily a roadmap for individuals who suspect that the Canadian Census might contain data useful in their research, if only they knew how to locate it. The second purpose is to introduce and describe a UTCS-maintained database that provides information on the tapes containing census data. Finally, this Guide provides sample programs for the programmer who must extract subsets of data from the census tapes.

The online Help files extend the UTCS Guide by discussing various aspects of using census data from CMS. This includes using the TAPES database from a CMS session and replacing, with appropriate CMS commands, the Batch JCL statements used in examples in the UTCS Guide.

The University has not yet decided on acquiring a portion of the 1986 Canadian Census data; the cost of this type of data has increased substantially since 1981. If and when it is acquired, the TAPES database will be updated to reflect the new acquisitions.

continued...

The TAPES Database

UTCS maintains a database about the tapes containing census data. The database itself is a SAS data set, which can be browsed with PROC FSBROWSE or listed, in part or in whole, with PROC PRINT. The information is also available as a LISTING file, which can be browsed with XEDIT within CMS.

In either form, this information is used to locate the external label, the internal label, the dataset name, and the file number for the tape file containing a particular census file. The fields containing this information are EXTERNAL, INTERNAL, TAPEFN, FILENUM, and CENSUSFN, respectively. The first four fields are needed to issue CMS MOUNT and FILEDEF commands.

The SAS data set is stored on the Census minidisk as a file called TAPES CENSUS. To use it, issue the following FILEDEF command before using SAS:

```
filedef census disk tapes census *
```

Once this FILEDEF has been issued, you can refer to the SAS data set as CENSUS.TAPES from within SAS.

Alternatively, you can access the same information directly from CMS in the form of a LISTING file. The file is stored on the Census minidisk as TAPES LISTING. It is ordered by three keys: year of census, census file name, and dataset name on tape. For example, use the command

```
browse tapes listing *
```

to begin browsing this LISTING file.

MVS Warning!

MVS will no longer
be available from UTCS
after

JUNE 30, 1988

The following services will be affected

I.P. Sharp APL
Batch (including CLASS E)
TSO
WYLBUR

If you are currently using any of these services please contact the UTCS staff listed below for assistance in conversion to our VM/CMS service.

Statistical & Numerical Applications
Bill Fehlner **978-6509**

Text & Imaging Applications
John Bradley **978-3995**

Commercial & Affiliated Customers
Ihor Prociuk **978-6875**

Tools for the Exodus from MVS

Bill Fehlner
FEHLNER at UTORONTO

In the last issue of *ComputerNews*, UTCS Director Warren Jackson announced the end of MVS service, effective June 30, 1988. This article offers some suggestions on how to move data off MVS, either to tape for later recovery or directly to VM/CMS. Users currently have data on disk, data on tape, programs in source, object and load format, and JCL procedures and Clists. Each of these topics is discussed below as it affects MVS users. APL use is considered separately at the end of this article

Data on Disk

Data may be stored on disk in a wide variety of ways. To complicate matters further, it is not always possible to determine from its current format which package or utility created the data. Your first step is to review your datasets and classify them. The table below lists many of the dataset structures that may occur. The second column indicates additional structure due to an application program. Column three gives tools for transfer to CMS. Column four lists tools for transfer to tape. Note well that some types of datasets (e.g., VSAM) must be converted to another form, before leaving the MVS environment, if the data is to be usable later.

STRUCTURE	PROGRAM	MOVE TO CMS	MOVE TO TAPE
Sequential	Char	GETUTCA, WYLCVT	IEBGENER
Sequential	WYLBUR	GETUTCA, WYLCVT	WUNPRESS
Sequential	binary	GETUTCA	IEBGENER
PDS	Char	WYLCVT	IEBGENER
PDS	WYLBUR	WYLCVT	WUNPRESS
PDS	binary	WYLCVT	IEBGENER
PDS	object lib.	GETUTCA	save the source
PDS	load lib.	user convert	user convert
DA	user created	user convert	user convert
DA	SAS	GETUTCA	SAS PROC XCOPY
DA	SPSSX	SPSSX EXPORT	SPSSX EXPORT
DA	SPSS-9	SPSSX convert	SPSSX convert
DA	BMDP	user convert	user convert
DA	MARKIV	user convert	user convert
VSAM ISAM		user convert	user convert

Data on Tapes

The key factor here is the utility or application program that wrote the tape. Several possibilities are listed below. Note well that tapes that are unreadable outside of MVS must be converted to another form, before MVS is removed, if the data is to be usable later.

UTILITY	ACCESSIBLE ON CMS?
IEBGENER	EBCDIC – no problem Standard ASCII – can be converted to EBCDIC WYLBUR edit format – not readable
IEBCOPY	Not readable
IEHMOVE	Not readable
SAS COPY	Can be read with SAS
SAS XCOPY	Can be read with SAS
SPSSX system	Not readable
SPSSX EXPORT	Can be read with SPSSX

continued...

Vendor-Supplied Programs

Packages currently on CMS are listed at the back of *ComputerNews*. In addition, EISPACK, LISREL, and NTYSYS will be installed on CMS before June 30, if CMS versions can be obtained. Note that some Class C packages on MVS will not be installed on CMS.

User Programs and Job Control Language

Some of those planning to move from MVS to CMS have catalogued JCL procedures, TSO Clists, or WYLBUR EXECs of their own. These procedures and programs must be converted after they have been transferred to CMS. JCL statements must be converted to a sequence of CMS commands. Catalogued procedures, TSO Clists and WYLBUR EXECs must be rewritten in REXX. Although the owners of these programs are ultimately responsible for doing this, they will need assistance in developing the necessary skills. Help will be provided in two ways: available documentation is being assembled into a kit for distribution in March; and a series of seminars will be held between March and June.

FORTRAN, SAS, and other source code should run in the CMS environment with small changes. Older programs, written in FORTRAN-66, for example, may require more work. You should be able to transfer FORTRAN object modules to CMS and then relink them. Load modules created on MVS are not usable in the CMS environment. If you are running production with load modules, you must locate source code and transfer it to a form accessible from CMS.

APL

A few users wish to continue using APL in some other environment. They will need to convert their workspaces and data files into a machine-readable form that can be accessed from the target APL system they choose.

SATN-22, a utility workspace available within SHARP APL, can be used to export workspaces and data files. SATN-22 produces a version of a workspace in character format that can be read by another APL and converted into programs and data in the new implementation.

If you have questions regarding the transfer of data to tape or CMS, please contact one of the following: Bill Fehlner (978-6509) for statistical and numerical applications, John Bradley (978-3995) for text and imaging applications. All commercial and affiliated customers should call Ihor Prociuk (978-6875), regardless of application.

CMS NAMES Command Now Allows Long Addresses

Steve Younker
POSTMSTR at UTORONTO

The NAMES command on CMS was designed to simplify your electronic mailing, and now it's been changed to be even better. If you don't know about the NAMES command on CMS, you should read the online Help for this command the next time you log on to the system. To view this Help, type **help names**.

In a nutshell, NAMES is a file that stores and invokes electronic addresses. It could be compared to a speed-dialer on a telephone. When you create a NAMES file, that file is added to your A Disk. If your USERID is JANEV, then the file will be called: JANEV NAMES A0. Then when you use the MAIL, SENDFILE, and NOTE commands, your NAMES file is searched for information about the recipient of your mail.

Let's see how you can use NAMES. Suppose you frequently send mail to your colleague, George Greystoke, at Oxford University in the United Kingdom. His address is:

cc075geo at vax71.oxfordu.ac.uk

This address is difficult to remember and a nuisance to type each time. If you have used NAMES in the past,

continued...

you know that such long addresses cannot be entered in the file. With the improved NAMES command, the screen layout now allows enough room for very long addresses.

If you have not used NAMES before, try entering George's address with the NAMES command. When you execute NAMES, you are presented with a special screen on which you can fill in information about the electronic addresses that you wish to store. You may save such details as the USERID, NODE name, Computer Nickname, Personal Name, Postal Address, and Telephone Number. Note, you *must* give CC075GEO a nickname. Once you have made this entry, whenever you send CC075GEO mail, you need specify only his nickname. Let's say you nicknamed him "george." To send him mail, you type **mail george**. When the mail screen opens up, the address field appears as:

```
To:  George Greystoke <cc075geo@vax71.oxfordu.ac.uk>
```

Note that "George Greystoke," the personal name you gave to NAMES, is automatically added at the **To**: line in your mail.

You can put a return address in your NAMES file by entering your own name through the NAMES command. After you have done this, your outgoing mail will contain your personal name as well as your computer USERID in the **From**: line:

```
From:  Jane Vine <janev@utoronto>
```

The NAMES file can also store the names of several people in a "group" entry. Thus, if you are the Chair of an Academic Committee on Planning, you can use electronic mail to distribute agendas to each member. How? Create an entry called PLAN in your NAMES file. All the names of the committee can be placed in the "List of Names" on the NAMES screen. When you send out an agenda or other mail intended for these people, you need only type **mail plan**, and a copy of your mail is sent to everybody on the list. Some of the people on the list may have separate entries in your NAMES file, with the personal name filled in. If so, their personal names will be listed automatically when you send a message with **mail plan**.

Long addresses cannot be used with the SENDFILE and NOTE commands, which can accept only eight-character USERIDs and NODE names. However, personal names and lists of names stored in your NAMES file *can* be used by one of these two commands.

Have a look at the online Help and see how useful the NAMES command can be to you.

Research Year-End

Marg Doherty
DOHERTY at UTORONTO

The fiscal year-end for most research grants, especially those issued by NSERC and MRC (3-500-NNN-NN to 3-699-NNN-NN), is March 31. However, in order to complete accounting to the granting agencies by that date, the final date for billing computing services to an Encumbrance Memo will be Thursday, March 24. (For purchases to be paid by Debit Memo, the deadline is March 21.)

To ensure that all charges for services to come off the grant are billed prior to the cancellation of the Encumbrance Memo, researchers should arrange for service completion or purchase of supplies as early in March as possible. This includes making sure all jobs are cleared from the system HOLD queues. If jobs in the queues are not printed or purged until after March 24, the researcher will continue to be charged.

When an Encumbrance Memo is cancelled and there is no other source of funding, such as a departmental subsidy, the entire account's allocation is removed, the account is locked, and service is suspended. A new Encumbrance Memo should be received by UTCS **no later than March 21** if service is not to be interrupted. An Encumbrance Memo based on Ledger 1 funds is not affected by this deadline.

For additional information on accounting procedures, obtain a copy of the UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting, available from UTCS Accounting Services, now located in Room 101, 4 Bancroft Avenue. Copies of the Encumbrance Memo form are available from the University Purchasing Department.

Documents at UTCS

All vendor-produced documentation may be ordered through the UTCS Information Office, Room 206, Engineering Annex. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call Dale Wright at 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the MVS and VM machines, special commands have been provided for this purpose.

To print online documents on:

IBM MVS
WYLBUR users type "do document?"
TSO users type "help document"
APL users type ")LOAD 1 UTCSGUIDE<RETURN>HELP"

IBM VM/CMS
Type "help document"

GP UNIX
Use *ipr* command

In these examples, the document to be printed is the UTCS Guide to Census Tapes (MANUAL/LISTING=CENSUS).
<RETURN> means RETURN or ENTER key.

```
TSO:        document census forms(yxle) <RETURN>

WYLBUR:     do document <RETURN> and respond to the prompts.

CMS:        document <RETURN> <RETURN>
            laser census listing (forms yxle <RETURN>

GP UNIX:    nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>
```

UTCS Documents in hardcopy:

New:

Previously announced:
Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics
UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Catalogue: Text Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online	MVS MANUAL	CMS LISTING	GP UNIX	Forms Code
New:				
Previously announced:				
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2	ACCESS2		/usr/doc/utcs/access2	*
UTCS Catalogue: IBM MVS Utilities	MVSUTIL	MVSUTIL		*
Product-Function List	UTILLIST	UTILLIST		BXQD
UTCS Catalogue: Numerical Products	NUMCAT	NUMCAT		*
Product-Function List	NUMLIST	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT	STATCAT		*
Product-Function List	STATLIST	STATLIST		BXQD
UTCS Catalogue: Text Products	TEXTCAT	TEXTCAT	/usr/doc/utcs/textcat	*
UTCS Guide to BMDP	BMDP	BMDP		*
UTCS Guide to Census Tapes	CENSUS	CENSUS	/usr/doc/utcs/census	*
UTCS Guide to GP UNIX			/usr/doc/utcs/gpunix	*
UTCS Guide to GPJS	GPJSX	GPJSX	/usr/doc/utcs/gpjs	*
UTCS Guide to Highspeed Printing	PRINT	PRINT	/usr/doc/utcs/print	*

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Documents continued

UTCS Documents online	**MVS MANUAL**	**CMS LISTING**	**GP UNIX**	**Forms Code**
New:				
Previously announced:				
UTCS Guide to IBM MVS Online Storage	IBMDISK	IBMDISK		*
UTCS Guide to Kermit	KERMIT	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to Micro File Transfer Service	MICROXFR	MICROXFR		*
UTCS Guide to Micro Laser Printing	MICRLASR	MICRLASR		*
UTCS Guide to SAS	SAS	SAS		*
UTCS Guide to SCRIBE (For printing instructions, see page 1 of document)		SCRIBE		*
UTCS Guide to Series/1 Terminal Use	SERIES	SERIES		*
3270 Emulation:				
Cybernex APL100 and Volker Craig VC404	CYBER	CYBER		*
DM1520	DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY	HARDCOPY		*
IBM 3101	IBM3101	IBM3101		*
IBM PC Kermit	PCKERMIT	PCKERMIT		*
SOROC IQ	SOROC	SOROC		*
VT52	VT52	VT52		*
VT100	VT100	VT100		*
UTCS Guide to SPSS	SPSS	SPSS		*
UTCS Guide to SUBUTILS	SUBUTILS	SUBUTILS		*
UTCS Guide to Text Processing on GP UNIX			/usr/doc/utcs/text	YXOG
UTCS Guide to TFW.MAK in SCRIBE		TFWMAK		*
UTCS Guide to TSO	TSOGD			*
UTCS Guide to UTDSUTIL	UTDSUTIL	UTDSUTIL		*
UTCS Guide to VM/CMS	CMSGD	CMSGD		*
UTCS Guide to WYLBUR	WYLINTRO			*
UTCS Rate Schedule (Commercial)		RATESCOM		†
UTCS Rate Schedule (External)		RATESEXT		†
UTCS Rate Schedule (Internal)		RATESINT		†
UTCS WYLBUR Tutorial	WYLTUTOR			*
Other Documentation online				
Kermit				
Kermit Protocol Manual	KERMITPM	KERMITPM		YXOE
Kermit User Guide	KERMITUG	KERMITUG		YXOF
ProComm				
ProComm Reference Manual	PROCOMM	PROCOMM		YXOE
VM Tape Documents				
TapeMap User's Guide and Reference		TAPEMAP		*
VMTAPE Messages and Codes		VMTMSGS		YXOE
VMTAPE User's Guide		VMTUSER		YXOE
VMSECURE				
VMSECURE User's Guide		VMSECURE		YXOE
Waterloo SCRIPT				
Reference Manual	WSCRPTRF	WSCRPTRF		YXLC
User's Guide	WSCRPTUG	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPST	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP	WSCRPTFP		YXLC
GML User's Guide	GMLUG	GMLUG		YXLC
GML Reference Summary	GMLRFSUM	GMLRFSUM		YXLC
OBS WYLBUR				
Messages and Codes	WYLMSGS			YXLD
Qwik Files	WYLQWIK			YXLD
Reference Summary	WYLREFCD			YXLG
Reference Manual	WYLREFMN			YXLD
7.0 Release Guide	WYLREL70			YXLC
User Guide	WYLUSER			YXLD
Electronic Mail				
A User's Guide to Electronic MAIL		MAILBOOK		YXOC

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* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Dale Wright	BC201	978-4990
Account & Access Code Enquiries (U of T)	Christine Gray	MP337	978-8703
Account & Access Code Enquiries (External)	Sylvia May	MP337	978-7148
IBM PC Maintenance	Kam Mark	BC103	978-5050
Tape Library (Academic Services)	Richard Foster	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Terminal Service	Rosi Tseu	BC105	978-3787
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, TSO and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-6200
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239
Datapac	4320 0056
Telnet	0302043200056
Tymnet	<backspace>DPAC;302043200056

UTCS Directory

Director:	Dr. Warren Jackson	MP350	978-8948	WCJ at UTORONTO *
Associate Director:	Eugene Siciunas	MP350	978-5058	EUGENE at UTORONTO *
Managers:				
Communications &Technical Support	Norman Housley	BC121B	978-4967	NORMAN at UTORONTO *
Information Centre	Don Gibson	BC217	978-7331	DON at UTORONTO *
Internal Systems Support	Ron Vander Kraats	MP350	978-4428	RVK at UTORONTO *
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	BILL at UTORONTO *

Committees on Computing

Committee on Administrative Computing	Chair	Janice Oliver	978-4322	
UTCS Board	Chair	Prof. D.M. Nowlan	978-4984	NOWLAN at UTORONTO *
Supercompter Users' Group at U of T	Chair	Prof. P.P. Kronberg	978-4971	

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
Erindale College (Erin), 828-5339, Mississauga Road, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
St.Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskins Ave., Room 024
Victoria University, 73 Queens Park Cres.

Sites		Hours of Access			Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039) ☐	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	Arranged by College
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	Arranged by College
Victoria	8:30-23:00	8:30-23:00	closed	closed	None	Arranged by College

Legend

* Research includes graduates, faculty, staff.
☐ Key access available.
† Access restricted to building hours.

Advising Hours

CAO	Monday through Friday, 10:00 - 18:00
Erin	Monday through Friday, 09:00 - 20:00

Sites	PACX	Network Terminal Server	CMS	Printers Terminals	CDF/PC
CDF	N	N	N	Y	N
EA	N	Y	N	Y	N
Erin	Y	Y	N	Y	N
Robarts	Y	N	N	Y	Y
Sidney	N	Y	N	Y	Y
St.Michael's	Y	N	N	Y	Y
Trinity	N	N	Y	Y	Y
Victoria	Y	N	N	Y	N

(Y=yes, N=no)

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS

- General Purpose Timesharing; access to NetNorth, BITNET, and EARN networks; access to CRAY X-MP
- 4381-R14 processor, 32 megabytes of memory
- CP operating system, VM/SP HPO R4.2
- CMS timesharing system, VM/SP Release 4
- RSCS spooling system, Release 3
- CRAY station Release 4

IBM MVS

- TSO, WYLBUR, APL, Batch
- runs as a preferred guest under VM
- MVS operating system
- Xerox 8700 Laser Printing

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications & Technical Support
Primary Phones: 978-3787, 978-4967

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs and Micro Vaxes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; and USENET, the UNIX networking fraternity
- will provide a communications solution to department needs on a contractual basis

Information Centre
Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
  - command languages, including CMS, TSO, WYLBUR, JCL, and UNIX
  - high level languages, including FORTRAN, and PL/I
  - packages and libraries, including SAS, SPSS-X, BMDP, IMSL, and NAg
  - editors and formatters, including XEDIT, TSO, WYLBUR, ed, SCRIBE, nroff/troff
- provides general micro support
  - selection consulting for hardware and software
  - Micro Lab for evaluation of hardware and software
  - advice on University discounts
  - media conversion and data transfer
  - operates UTCS Microcomputer Bulletin Board System
  - offers Micro Laser Printing Service
  - offers 35mm slide production service using Polaroid Palette
  - administers Local Area Network of PCs for Education Facility
  - administers Macintosh Education Facility
- high quality typesetting
- installs and maintains application packages
- provides short courses and seminars on the more popular services and software packages

> The principal mandate of UTCS is to plan, implement, and operate facilites and "common-carrier" networks, and to plan and support divisional, departmental or project computer facilities as requested.

Facilities Managed by UTCS

Administrative Computing

- administrative IMS/VS, DB/DC, DB2, Batch, and TS0
- 4381-R14 processor, 32 megabytes of memory
- MVS operating system

Computer Disciplines Facility/UNIX

VAX-11/780, 4 megabytes of memory (cdfa)
- Computer Science interactive access
- UNIX (Berkeley UNIX 4.3bsd)

SUN 3/280, 8 megabytes of memory (cdfb)
- Computer Science interactive access
- SUN UNIX 3.5

VAX-11/750, 4 megabytes of memory (cdfc)
- Computer Science interactive access
- UNIX (Berkeley UNIX 4.3bsd)

Computer Disciplines Facility/PC

- 97 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory
- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/22
- 2 processors, 2 megawords main memory
- solid state disk (SSD) with 16 megawords of storage
- COS 1.15 operating system
- VAX-11/750 + microVAX II providing VMS front-end services directly and to VMS and UNIX nodes
- VM front-end services provided by UTCS 4381-R03

UTCS Software List

SOFTWARE LIST for MAINFRAME COMPUTERS MVS, VM/CMS, UNIX

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support. For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
Communications			
Kermit	VM/CMS	A	---
	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
MICROLASER	VM/CMS	A	---
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rep *(Access via TCP/IP to most of the networked machines on all three campuses)*	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
rje	UNIX	B	---
Graphics			
PLOTBASIC (FORTRAN)	MVS	A	---
	VM/CMS	C	---
PLOTBASIC EXTENDED ROUTINES	MVS	A	---
SAS/GRAPH	MVS	A	5.16
	VM/CMS	A	5.16
SURFACE II	MVS	C	---
Languages			
APL (Sharp)	MVS	C	May 83
ALGOLW (Stanford)	MVS	C	n/a
ASSEMBLER(F)	MVS	C	2.1
	VM/CMS	C	---
A.A.E.C. PASCAL	MVS	C	2.0
Concurrent Euclid	VM/CMS	C	1.9
FORTRAN H EXT.	MVS	B	2.2.1
FORTUTILS	VM/CMS	A	2.2
LISP	MVS	C	---
MARKEXAM	MVS	C	---
PL/C	MVS	C	---
PL/I CHECKOUT COMPILER	MVS	B	1.3.0
	VM/CMS	B	1.3.0
PL/I OPT COMPILER	MVS	B	1.5.1
	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	MVS	C	3.5
	VM/CMS	C	3.5
SPITBOL	MVS	C	---
Turing	VM/CMS	C	---
UTCS FORTRAN UTILITIES	MVS	B	---
VS COBOL	MVS	C	2.4
VS FORTRAN	MVS	A	1.4.1
	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
WATBOL	MVS	C	V3L2
Waterloo C	VM/CMS	C	1.3
WATFIV	MVS	B	---
	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
Numerical			
DYNAMO	MVS	B	4.07
EISPACK	MVS	C	4
FORMAC	MVS	C	---
FUNPACK	MVS	C	---
GPSS	MVS	A	Rel.1, Mod. Level 4
IMSL	MVS	A	9.2
	VM/CMS	A	9.2

Software List continued

Package/Compiler	System	Support	Version
LINPACK	MVS	C	---
	VM/CMS	C	---
MINOS	MVS	C	4.0
MINPACK	MVS	C	1
MPSX	MVS	C	Rel.1, Mod. Level 6
NAg	MVS	A	Mark 11
Statistical			
BMD	MVS	C	---
BMDP	MVS	A	Level 85, Level 87
	VM/CMS	A	Level 85, Level 87
GENSTAT	MVS	C	4.04B
Minitab	VM/CMS	B	5.1
NAg	MVS	A	Mark 11
NTSYS	MVS	C	Dec. 1982
SAS	MVS	A	5.16
	VM/CMS	A	5.16
SPSS	MVS	C	9.1
SPSS^x	MVS	A	2.2
	VM/CMS	A	2.2
TSP	MVS	C	3.5
Text Processing			
COGS (Concordance Generating System)	MVS	B	3.1
KWIC	MVS	C	---
OCP (Oxford Concordance Program)	MVS	C	1.4
SCRIBE	VM/CMS	A	4(1400)-1
Waterloo SCRIPT	MVS	B	85.1
	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	A	n/a
MICROLASER	VM/CMS	A	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	A	---
tbl	UNIX	A	---
pic	UNIX	C	---
troff	UNIX	A	---
nroff	UNIX	A	---
TeX	UNIX	C	---
Utilities			
DFSORT	MVS	A	6.0
DSMAP	MVS	A	---
FILEBOL	MVS	C	---
FORTUTILS	VM/CMS	A	2.2
GRIPE	MVS	A	---
IBM UTILITIES	MVS		---
IEBGENER	MVS	A	---
IEBCOPY	MVS	A	---
IEHMOVE	MVS	A	---
TAPEPRT	MVS	A	---
TAPEEXRAY	MVS	A	---
TCOPY	MVS	A	---
TPRINT	VM/CMS	C	---
UTCS FORTRAN UTILITIES	MVS	B	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csh	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

Software List continued

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the *Academic's Guide to Microcomputer Systems.*

Package/Compiler	Support	Version
Communications		
Kermit (MS-DOS)	A	2.27d
Kermit (APPLE II)	A	---
Kermit (CP/M)	C	---
Kermit (Macintosh)	B	0.8(35)
PC TALK3	C	---
PC PLOT III	A	---
ProComm	A	2.42 UT
MacTerminal	B	---
WYLBUR/PC	C	---
Database Managers		
4th Dimension	B	Int. 1.03
AskSam	C	2.2
Clipper	B	---
DATAEASE	B	---
dBASE II (CP/M)	B	---
dBASE II (MS-DOS)	C	--
dBASE III (MS-DOS)	A	1.1
dBASE III Plus	A	1.1
FoxBASE	C	2.14u
Notebook II	B	2.03
REFLEX	B	---
ViewFinder III	B	---
ZyINDEX	B	---
Desktop Publishing		
PageMaker (Macintosh)	B	2.0a
PageMaker (IBM PC)	B	1.0a
Ventura (IBM PC)	B	1.1
XPress (Macintosh)	C	1.0
Graphics		
DR HALO	C	---
Illustrator	B	1.0
Lotus 1-2-3	B	---
Microsoft CHART (Macintosh)	C	---
MacDraw	C	---
MacPaint	B	---
WATCOM GKS	B	---
35mm Express	B	---
Freelance Plus	B	2.0
Languages		
BASIC	A	---
Microsoft FORTRAN	C	---
TURBO Pascal	B	---
WATFOR-77	A	---
Operating Systems, Utilities		
APPLE Turnover (Macintosh)	A	---
CP/M	B	---
FASTBACK	B	---
Finder (Macintosh)	A	5.5
Hypercard (Macintosh)	A	1.01
PC-DOS	A	3.2
Sidekick	B	---
SuperKey	C	---
System (Macintosh)	A	4.1
TURBO Lightning	C	---
XenoDisk	A	1.41
Spreadsheet		
APPLEWORKS	C	---
HAL	B	---
Lotus 1-2-3	B	2.01
Microsoft Excel (PC)	C	---
Multiplan (Macintosh)	C	---

Software List continued

Package/Compiler	Support	Version
Sound		
SoundWave (Macintosh)	B	1.0
Statistical		
Minitab	C	---
PowerStat	C	1.04
SAS/PC	A	6.02
SPSS/PC +	A	---
STATPRO	C	2.0c
Statview (Macintosh)	C	1.0
Word Processing		
Gutenberg Senior	C	---
FinalWord II	B	2.0
MacWrite	C	---
Manuscript	C	---
Microsoft Word (Macintosh)	A	3.01
Microsoft Word (MS-DOS)	A	4.0
Nota Bene	B	2.0
T^3	C	---
Volkswriter Scientific	C	---
WordPerfect	A	4.1; 4.2
WordStar	B	---

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